(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 January 2002 (31.01.2002)

PCT

(10) International Publication Number
WO 02/08082 A1

(51) International Patent Classification[7]: B65D 47/42

(21) International Application Number: PCT/US01/22031

(22) International Filing Date: 13 July 2001 (13.07.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/620,079 20 July 2000 (20.07.2000) US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
US 09/620,079 (CON)
Filed on 20 July 2000 (20.07.2000)

(71) Applicant *(for all designated States except US)*: **THE GILLETTE COMPANY** [US/US]; Prudential Tower Building, Boston, MA 02199 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **TUCKER, William, E.** [US/US]; 9 Powers Lane, Attleboro, MA 02703 (US). **O'CONNOR, William, T.** [US/US]; 18 Gordon Drive, Londonderry, NH 03053 (US). **KERRISSEY, Timothy, G.** [US/US]; 656 Granite Street, Braintree, MA 02184 (US). **BOURQUE, Steven, M.** [US/US]; 14 Nottingham Lane, Bradford, MA 10835 (US).

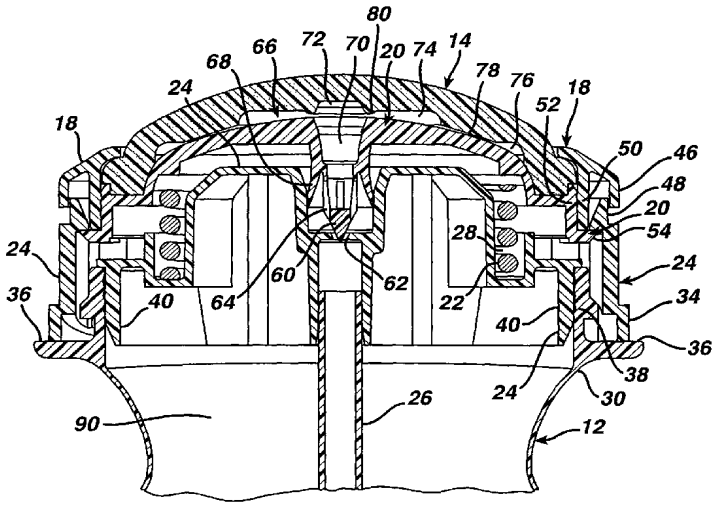
(74) Agents: **HANDELMAN, Joseph, H.** et al.; Ladas & Parry, 26 West 61st Street, New York, NY 10023 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: LIQUID APPLICATOR



(57) Abstract: An applicator (10) for local application of a liquid to a person's skin. The applicator includes a porous dome (14), a chamber (66, 72, 74, 76) under the dome, a squeeze bottle (12) providing a reservoir (90) containing the liquid, and a tube (26) from the squeeze bottle (12) to the chamber. The porous dome (14) has pores sized to provide liquid transport therein by capillary action. The chamber provides a location for liquid in position to be transported into the dome (14). Increased pressure in the reservoir (90) from squeezing the bottle (12) causes liquid to flow from the reservoir (90) through the tube (26) to the chamber, and decreased pressure in the reservoir from releasing the bottle causes excess liquid in the chamber to flow from the chamber through the tube to the reservoir. Also disclosed is an applicator including a squeeze bottle having a relatively rigid molded open-end portion connected to a porous dome and an integral flexible, blow-molded reservoir portion that can be squeezed to a reduced volume condition to deliver liquid to the dome and has memory to return to an unsqueezed volume condition.

WO 02/08082 A1

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

LIQUID APPLICATOR

The invention relates to an applicator that can be used for the local application of a liquid product to a person's skin.

Personal use products such as antiperspirants, deodorants and cosmetics can be applied to a user's skin in various forms by various devices. For example, deodorants and/or antiperspirants can be delivered as a spray from a pressurized container or a spray bottle, as a solid from a solid stick dispenser, or as a liquid from a roll-on applicator or a porous dome applicator.

In one aspect, the invention features, in general, an applicator for local application of a liquid to a person's skin. The applicator includes a porous dome, a chamber under the dome, a squeeze bottle providing a reservoir containing the liquid, and a tube from the squeeze bottle to the chamber. The porous dome has pores sized to provide liquid transport therein by capillary action. The chamber provides a location for liquid in position to be transported into dome. Increased pressure in the reservoir from squeezing the bottle causes liquid to flow from the reservoir through the tube to the chamber, and decreased pressure in the reservoir from releasing the bottle causes excess liquid in the chamber to flow from the chamber through the tube to the reservoir.

In another aspect, the invention features, in general, an applicator for local application of a liquid to a person's skin that includes a porous dome, a squeeze bottle providing a reservoir containing the liquid, and a tube to convey liquid from the squeeze bottle to the dome. The bottle is made of a relatively rigid plastic (e.g., polyethylene terephthalate) and includes a relatively rigid, molded open-end portion connected to the dome and an integral flexible, blow-molded reservoir portion that can be squeezed to a reduced volume condition to deliver liquid to the dome and has a memory to return to an unsqueezed volume condition.

Particular embodiments of the invention may include one or more of the following features. The applicator can include a valve operable to block flow through the tube, and a cap that causes the valve to be closed when the cap is connected to the squeeze bottle. The applicator can include a dome adapter located between the squeeze bottle and the porous dome, such that the chamber providing liquid to the porous dome is defined by the dome adapter and the porous dome.

The dome adapter can have a central passage and a valve structure at the bottom of the central passage, the valve structure being in fluid communication with the tube. A collar can be used to connect the dome adapter to the porous dome. The applicator can include a bottle adapter connected to the bottle, with the porous dome being movably mounted with respect to the bottle adapter. The collar can be slidably mounted with respect to the bottle adapter. The bottle adapter can have a central portion that is sealably connected to the tube and has an opening in communication with the tube. The applicator can have a spring between the bottle adapter and the dome adapter that biases the valve structure away from the opening. The dome adapter can include a sliding seal with the bottle adapter around the opening. The bottle adapter can snap onto the squeeze bottle.

The chamber and porous dome are preferably dimensioned and shaped so as to provide preferential blooming of the liquid at the center of the dome first and subsequent blooming of liquid closer to the periphery of the dome. The chamber and dome are also dimensioned and shaped so that, when the user releases the squeeze bottle, excess liquid on the top of the dome is pulled back into the applicator, and is preferentially first removed from the peripheral portions and then from the central portion. The chamber can have a central volume area that communicates with the tube, a peripheral volume area, and a constricted region connecting the central volume area to the peripheral volume area to provide the preferential blooming. The porous dome has a stepped recess surface with a central recess that provides the central volume area and a peripheral recess that provides the peripheral volume area.

The porous dome is preferably made of sintered plastic, e.g., sintered high-density polyethylene, and preferably is made of round particles to provide a smooth surface for contacting the skin. The sintered plastic has an average pore size between 10 and 30 microns, preferably around 18 microns.

Embodiments of the invention may include one or more of the following advantages. The applicator provides a uniform dose of liquid to the porous dome without large droplets on the dome surface or drips down the side of the applicator. A uniform, thin layer of liquid is applied to the user's skin surface without irritation. The applicator does not leak liquid, and is easy to manufacture.

Other features and advantages of the invention will be apparent from the following detailed description of a particular embodiment thereof and from the claims.

Figure 1 is a perspective view of a liquid applicator shown with a cap.

Figure 2 is an exploded perspective view of the Figure 1 applicator and cap.

Figure 2A is a perspective view, partially cut away, of the Figure 1 applicator and cap.

Figure 3 is a partial vertical sectional view of the Figure 1 applicator without its cap and with the applicator components in an operative, open position.

Figure 3A is a partial vertical sectional view of the Figure 1 applicator taken at a different location than for Figure 3.

Figure 3B is a partial perspective view of an alternative embodiment of the Figure 1 applicator.

Figure 4 is a partial sectional view of the Figure 1 dispenser with its cap and with the applicator components in an inoperative, closed position.

Referring to Figure 1, there is shown liquid applicator 10 including squeeze bottle 12, porous dome 14 and removable cap 16.

Referring to the exploded diagram shown in Figure 2 and the cut away view of Figure 2A, it is seen that porous dome 14 is connected to squeeze bottle 12 by various components. These include collar 18, dome adapter 20, spring 22, bottle adapter 24, and dip tube 26. Spring 22 sits in annular recess 28 in bottle adapter 24. Collar 18 makes a snap-fit connection to dome adapter 20 in order to retain porous dome 14 thereon. The combined unit of collar 18, dome adapter 20 and porous dome 14 make a snap fit connection onto bottle adapter 24 with the combined unit being slidably movable on bottle adapter 24 and biased upward by spring 22. Bottle adapter 24 makes a snap-fit connection to the upper connecting end 30 of squeeze bottle 12, which has a snap connector 32.

Bottle 12 is made of molded and blow molded polyethylene terephthalate. Alternatively, other relatively rigid plastics (e.g., ethylene vinyl alcohol) can be used, depending on compatibility with the liquid being dispensed.

The plastic should be rigid enough to provide sufficient mechanical molded strength to mechanically connect and seal to bottle adapter 24 at molded, upper connecting end 30, but also be capable of being blow-molded at the lower portion to provide a flexible wall that can be squeezed and that returns to its initial position when released.

Porous dome 14 is made of sintered high-density polyethylene. Cap 16, collar 18, dome adapter 20, and bottle adapter 24 are made of polypropylene. Dip tube 26 is made of polyethylene.

Referring to Figure 3, it is seen that bottle adapter 24 has an outer annular portion 34 that rests on top of flange 36 of connecting end 30 of squeeze bottle 12 outside of annular extension 38 of squeeze bottle 12. Bottle adapter 24 also has an inner annular portion 40 that is located inside of annular extension 38 and makes a seal between squeeze bottle 12 and bottle adapter 24. Tab 39 (Figure 3A) of extension 38 locks with tab 41 of portion 34 to provide a snap-fit connection of bottle adapter 24 to connecting end 30 of bottle 12. Outer annular portion 34 contains helical grooves 42 (Figure 2) for mating with projections 44 on the inside of cap 16 in order to positively lock cap 16 in the precise, desired axial position on connecting end 30 so as to guarantee valve closure, as described below. Other types of locking closures can be used, e.g., using groove 31 as shown in Fig. 3B.

Still referring to Figure 3, collar 18 has an outer annular portion 46 that slides on the outside of upper extension 48 of annular portion 34 of bottle adapter 24. Collar 18 also has inner annular portion 50 that slides on the inside of extension 48. Inner annular portion 50 is sealably connected to lower wall 52 of dome adapter 20. Collar 18 locks porous dome 14 in position between collar 18 and dome adapter 20 so that the three components move as a combined unit on bottle adapter 24.

Spring 22 pushes dome adapter 20 upward to the upper position shown in Figure 3. Tab 54 on dome adaptor 20 acts as a stop against the lower shelf portion of extension 48, preventing dome adapter 20 and the attached components from going higher. Dome adapter 20 carries, at its center, valve structure 60, which is positioned over opening 62 in bottle adapter 24. In the position shown in Figure 3, valve 60 is spaced from opening 62 slightly, such that

liquid from tube 26 can pass through opening 62 and upward through slots 64 to the chamber 66 defined between porous dome 14 and dome adapter 20. Cylindrical extension 68 at the center of dome adapter 20 provides a sliding, liquid-tight seal between dome adapter 20 and bottle adapter 24 so that the liquid cannot flow into the area containing spring 22 but instead is directed up through central passage 70 to chamber 66.

Porous dome 14 has a stepped recess lower surface including central recess 72, intermediate annular recess 74, and peripheral annular recess 76. Intermediate recess 74 communicates with peripheral recess 76 by restricted region 78. Intermediate recess 74 similar communicates with central recess 72 to via restricted region 80. Porous dome 14 is made of sintered round particles of high density polyethylene and has an average pore size between 10 and 30 microns, preferably around 18 microns.

The snap fit connections for all parts in applicator 10 provide for ease of manufacture.

When using applicator 10, the user first twists cap 16 relative to bottle 12 to release projections 44 from the locked positions in grooves 42. As cap 16 is removed, valve structure 60 is moved from the closed position shown in Figure 4 to the open position shown in Figure 3. This action occurs because spring 22 is now free to move dome adapter 20 upward from bottle adapter 24 until tab 54 reaches the stop position. With valve 60 in the open position, there is a fluid communication from reservoir 90 to chamber 66 through tube 26.

When the user squeezes bottle 12, the decreased volume and increased pressure in reservoir 90 causes liquid to flow through tube 26 and opening 62, slots 64 and central passage 70 into chamber 66. The liquid is first directed to the central recess 72 and is delayed in travel into intermediate recess 74 owing to the small flow area of restricted region 80. As further liquid is pumped up to central recess 72, owing to the increased pressure in reservoir 90, the liquid from intermediate recess 74 can continue outward to peripheral recess 76. By this time, the liquid that had initially entered recess 72 has been transported by capillary action and pressure displacement to the upper surface of dome 14. Shortly thereafter, liquid from the intermediate annular recess 74 passes through dome 14 to

the intermediate region of surface, and lastly liquid from peripheral portion 76 passes to the upper surface of dome 14. The liquid passes through the pores in porous dome 14 by capillary action and by positive pressure displacement. The pores in dome 14 are sufficiently large to permit flow of the proper amount of liquid, but small enough to avoid formation of large droplets on the surface.

When the user releases the squeeze bottle, excess liquid on the top of dome 14 is pulled back into the applicator. The liquid is preferentially first removed from the peripheral portions and then from the intermediate portion and then from the central portion. The excess liquid is transported through chamber 66 and back through tube 26 along with air that replaces the volume of liquid removed from the reservoir and remaining in dome 14, owing to capillary forces, so that squeeze bottle 12 will maintain its shape. After the excess liquid has been removed, a predetermined amount of liquid remains within porous dome 14 for application to the user's skin. The preferential inward-out blooming when squeezing the bottle, and the preferential outward-in removal when releasing the bottle, avoids having product drip down the side of the applicator.

When the user slides porous dome 14 over the skin surface, a thin, uniform layer of liquid product is applied to the skin surface. The use of round particles in the sintered plastic of porous dome 14 provides a smooth comfortable surface and pores of the uniform size to provide capillary flow.

After use, cap 16 is then connected by mating projections 44 in grooves 42. This causes dome adapter 20 to be pushed downward from the position shown in Figure 3 to the position shown in Figure 4, and valve structure 60 moves downward to close opening 62 and prevent leakage of liquid from reservoir 90. Cap 16 locks into place in an on/off manner so that the user knows that it is sealed when it the cap is closed, in order to avoid leakage of liquid.

Other embodiments of the invention are within the scope of the appended claims.

CLAIMS

1. An applicator for local application of a liquid to a person's skin comprising:

a porous dome having pores sized to provide liquid transport therein by capillary action,

a chamber under said porous dome for containing said liquid in position to be transported into said dome,

a squeeze bottle providing a reservoir of said liquid under said chamber, said dome being mounted on said squeeze bottle, and

a tube connected between said reservoir and said chamber such that increased pressure in said reservoir from squeezing said bottle causes liquid to flow from said reservoir to said chamber, and decreased pressure in said reservoir from releasing said bottle causes excess liquid in said chamber to flow from said chamber to said reservoir.

2. The applicator of claim 1, further comprising a valve operable to block flow through said tube.

3. The applicator of claim 2, further comprising a cap that is connectable to said squeeze bottle, said cap covering said dome and causing said valve to be closed when said cap is connected to said squeeze bottle.

4. The applicator of claim 1, further comprising a dome adapter located between said squeeze bottle and said porous dome, and wherein said chamber is defined by said dome adapter and said porous dome.

5. The applicator of claim 4, wherein said dome adapter has a central passage and a valve structure at the bottom of said central passage, said valve structure being in fluid communication with said tube.

6. The applicator of claim 1, further comprising a bottle adapter connected to said bottle, and wherein said porous dome is movably mounted with respect to said bottle adapter.

7. The applicator of claim 6, wherein said bottle adapter has a central portion sealably connected to said tube, and an opening in communication with said tube.

8. The applicator of claim 7, further comprising a dome adapter, and

wherein said chamber is defined by said dome adapter and said porous dome, and wherein said dome adapter has a central passage and a valve structure at the bottom of said central passage, said valve structure interacting with said opening to permit or block fluid communication between said chamber and said reservoir.

9. The applicator of claim 8, further comprising a cap that is connectable to said squeeze bottle, said cap covering said dome and causing said valve structure to close said opening when said cap is connected to said squeeze bottle.

10. The applicator of claim 8, further comprising a spring biasing said valve structure away from said opening.

11. The applicator of claim 10, wherein said spring is mounted between said bottle adapter and said dome adapter.

12. The applicator of claim 1, wherein said chamber and said porous dome are dimensioned and shaped so as to provide preferential blooming of said liquid at the center of the dome first and subsequent blooming of liquid closer to the periphery of the dome.

13. The applicator of claim 11, wherein said chamber has a central volume area that communicates with said tube, a peripheral volume area, and a constricted region connecting the central volume area to the peripheral volume area to provide said preferential blooming.

14. The applicator of claim 13, wherein said porous dome has a stepped recess surface with a central recess that provides said central volume area and, a peripheral recess that provides said peripheral volume area.

15. The applicator of claim 8, further comprising a collar that connects said dome adapter to said dome.

16. The applicator of claim 15, wherein said collar is slidably mounted with respect to said bottle adapter.

17. The applicator of claim 1, wherein said porous dome is made of sintered plastic.

18. The applicator of claim 13, wherein said applicator is made of sintered high-density polyethylene.

19. The applicator of claim 13, wherein said sintered plastic is made of

round particles.

20. The applicator of claim 15, wherein said sintered plastic has an average pore size between 10 and 30 microns.

21. The applicator of claim 16, wherein is said dome adapter includes a sliding seal with said bottle adapter around said opening.

22. The applicator of claim 6, wherein said bottle adapter snaps onto said squeeze bottle.

23. A liquid applicator for local application of a liquid to a person's skin comprising:

a porous dome having pores sized to provide liquid transport therethrough by capillary action,

a squeeze bottle providing a reservoir of said liquid under said chamber, said dome being mounted on said squeeze bottle, and

a tube connected to direct liquid from said reservoir to said dome,

wherein said bottle includes a relatively rigid molded open-end portion connected to said dome and an integral flexible, blow-molded reservoir portion that can be squeezed to a reduced volume condition to deliver liquid to said dome and has memory to return to an unsqueezed volume condition.

24. The applicator of claim 23, wherein said bottle is made of polyethylene terephthalate.

25. The applicator of claim 23, further comprising a bottle adapter connected to said open-end portion of said bottle, and wherein said porous dome is movably mounted with respect to said bottle adapter.

26. The applicator of claim 25, wherein said bottle adapter snaps onto said squeeze bottle.

27. The applicator of claim 26, further comprising a chamber under said porous dome for containing said liquid in position to be transported into said dome, wherein said tube is connected between said chamber and said reservoir.

FIG. 1

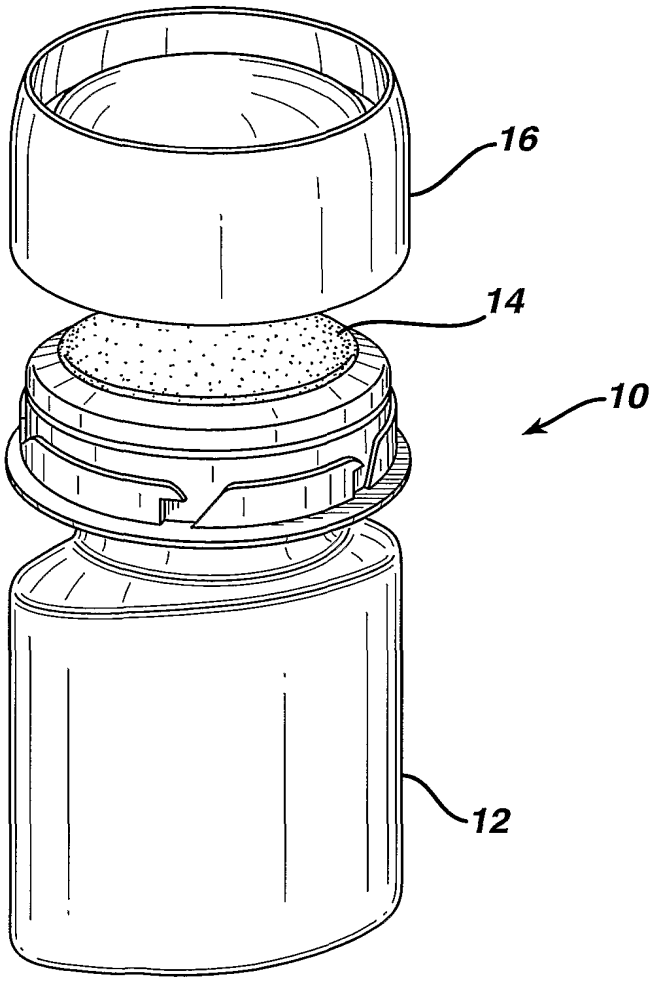


FIG. 2

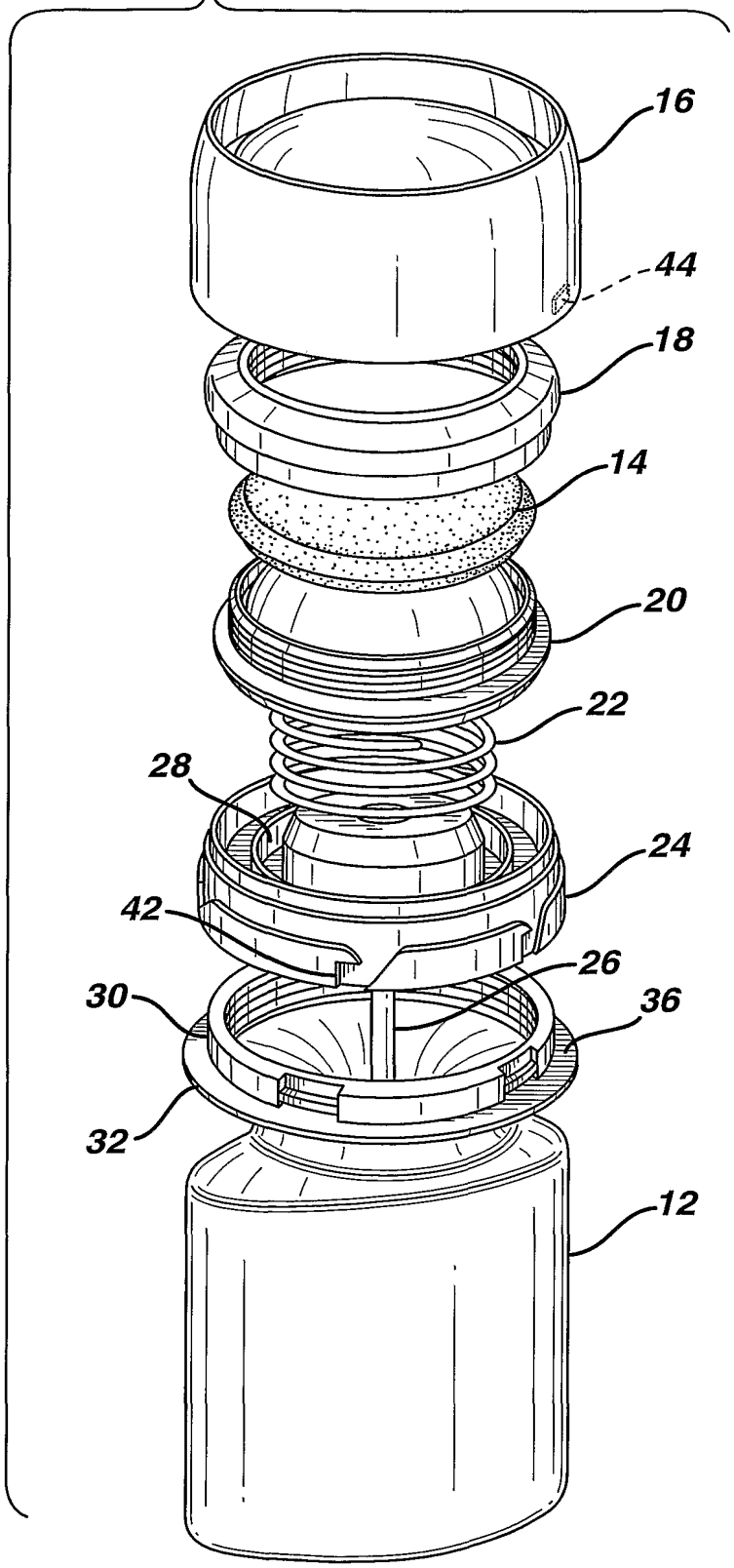


FIG. 2A

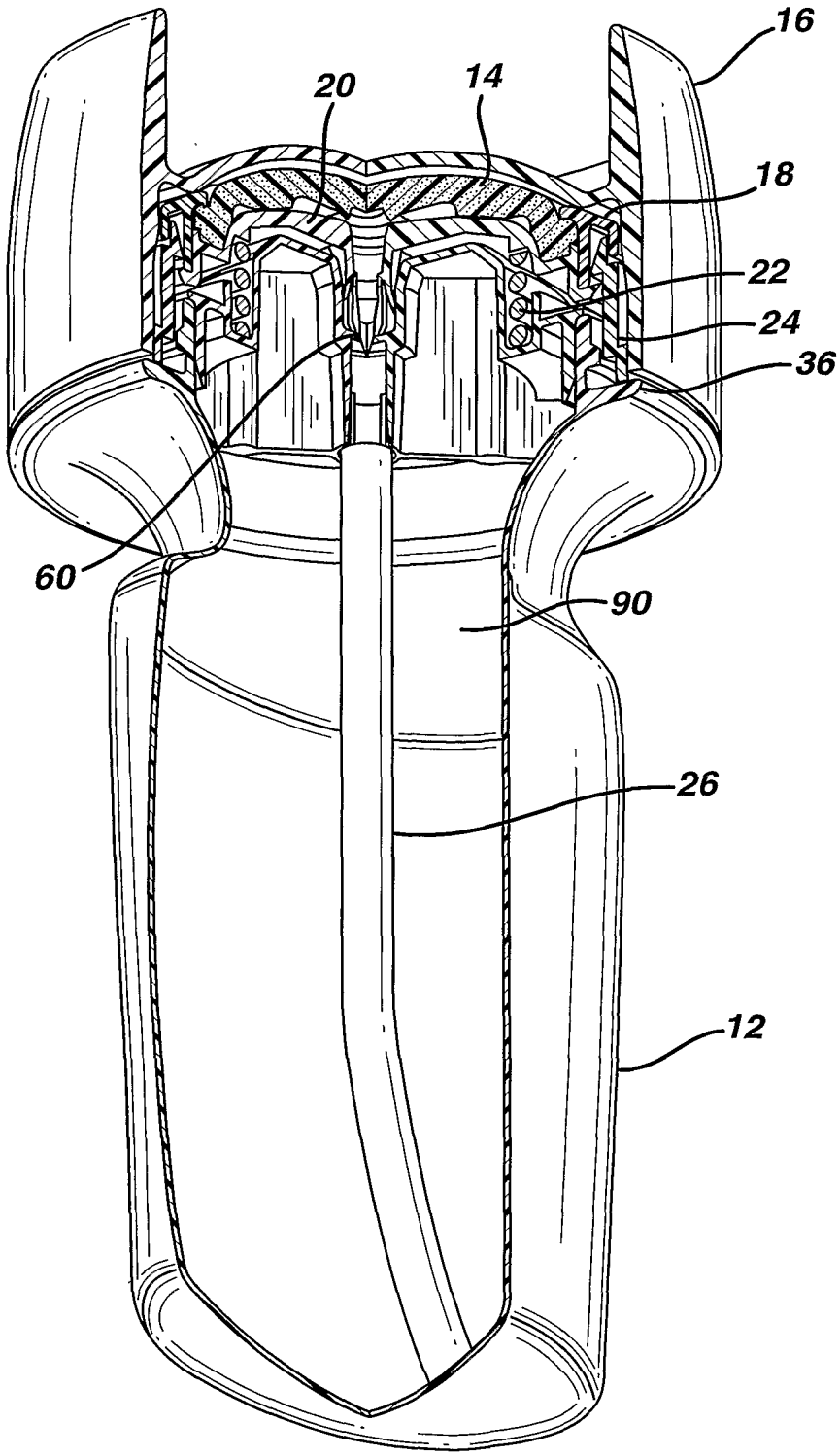


FIG. 3

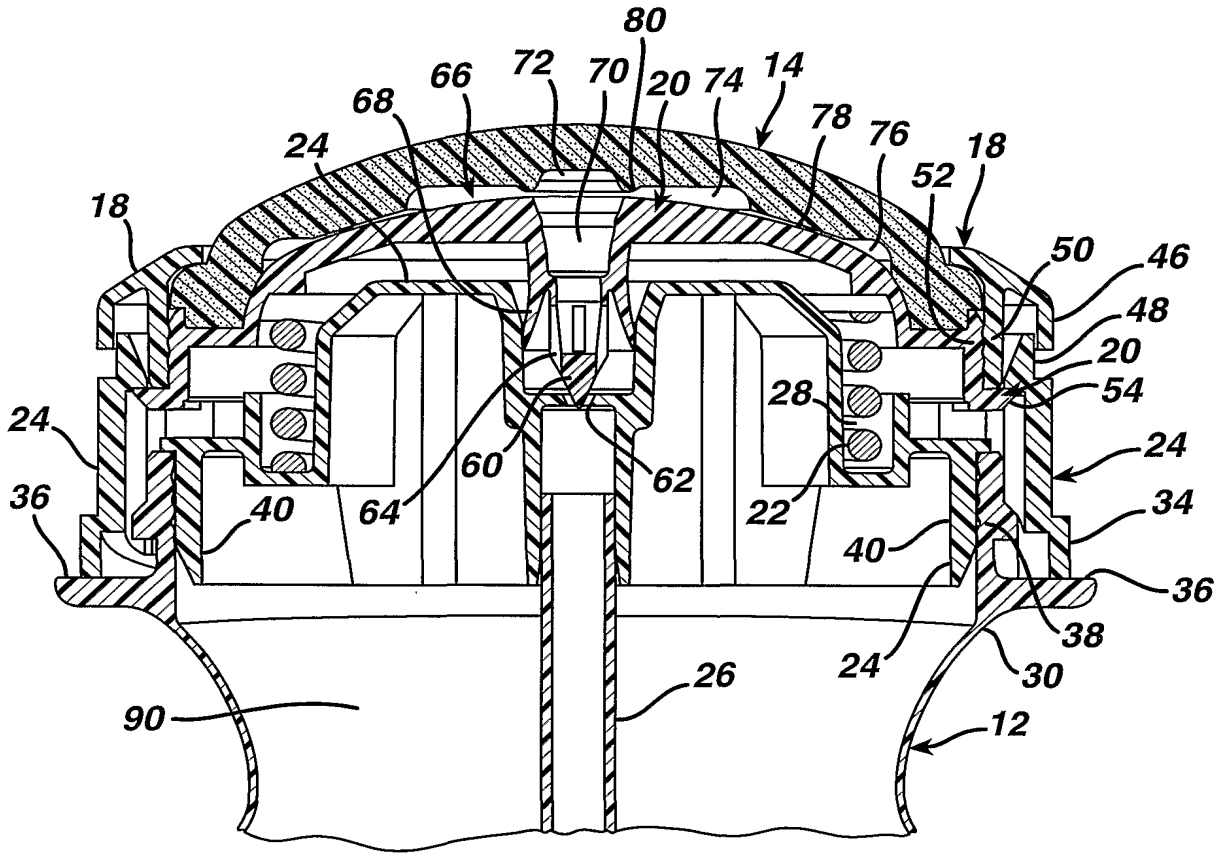

80
72
70
66
68
20
74
14
78
76
18
52
24
18
50
46
48
20
54
28
24
24
36
40
64
60
62
22
40
34
36
38
24
30
26
90
12

FIG. 3A

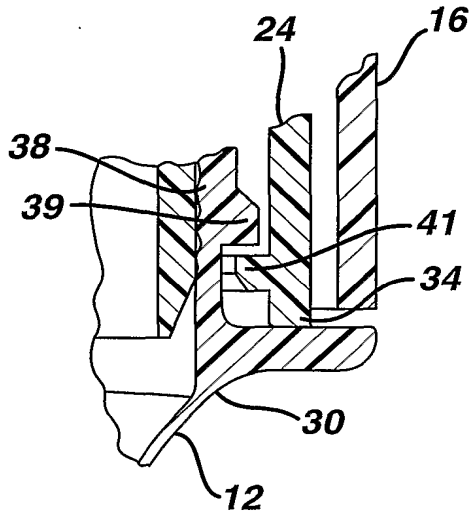


FIG. 3B

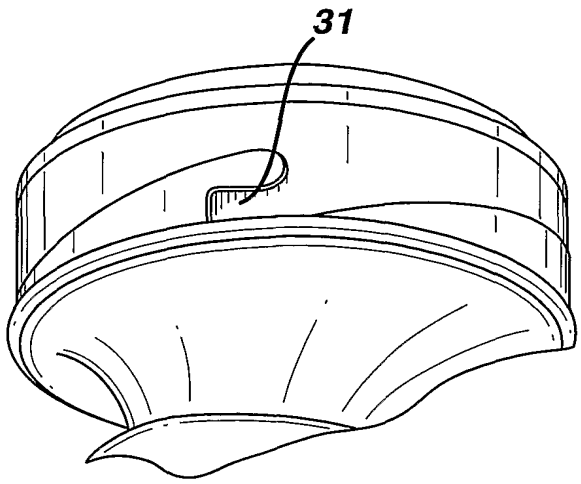
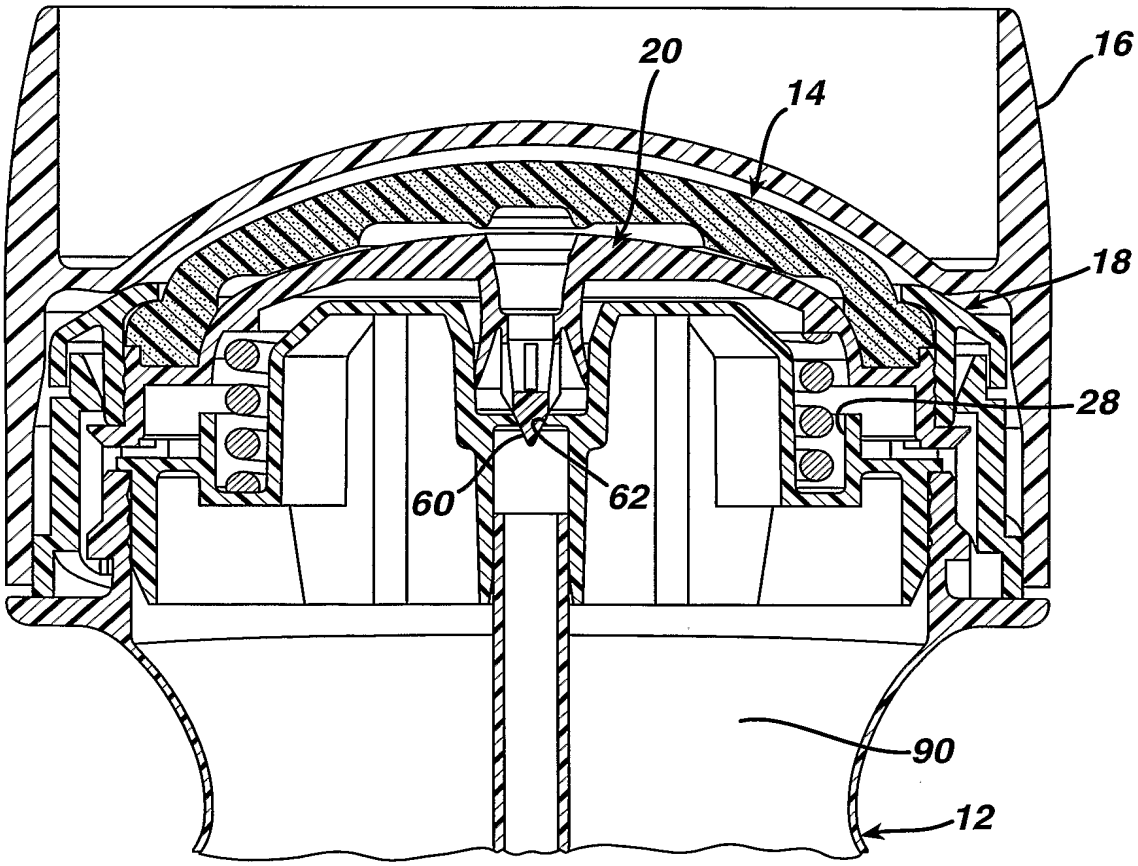


FIG. 4



INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/22031

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D47/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2 716 250 A (DEAKERS THORPE W) 30 August 1955 (1955-08-30) column 2, line 25 -column 3, line 58; figures 1-9	1-3,12, 23,25,27 9,10,21
A	US 5 018 894 A (GONCALVES ANTONIN) 28 May 1991 (1991-05-28) column 1, line 37-48 -column 4, line 18-22; figures 1-3	1,12,13, 17,18, 23,24
A	US 5 230 579 A (KLAWSON RENNOLD L ET AL) 27 July 1993 (1993-07-27) column 2, line 25-32; figures 1-19	1,2,9, 17,22, 23,26

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 November 2001	26/11/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Vollering, J

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/22031

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 506 564 A (EMBALLAGES CONSEILS ETUDES) 30 September 1992 (1992-09-30) column 1-5; figures 1-5	1,2,10
A	GB 2 119 772 A (K P L LIMITED) 23 November 1983 (1983-11-23)	

INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir tional Application No
PCT/US 01/22031

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2716250 A	30-08-1955	NONE	
US 5018894 A	28-05-1991	FR 2647034 A1	23-11-1990
		CA 2016977 A1	18-11-1990
		DE 4016139 A1	22-11-1990
		ES 2034904 A6	01-04-1993
		GB 2232074 A ,B	05-12-1990
		IT 1240375 B	10-12-1993
		JP 3004962 A	10-01-1991
		NL 9001155 A	17-12-1990
		SE 9001779 A	19-11-1990
US 5230579 A	27-07-1993	NONE	
EP 0506564 A	30-09-1992	FR 2674453 A1	02-10-1992
		EP 0506564 A1	30-09-1992
		JP 6154025 A	03-06-1994
GB 2119772 A	23-11-1983	NONE	